

13 Codes of Ethics and the Moral Education of Engineers

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Codes of ethics have a significant place in the history of the engineering profession, but in their present form they have perhaps outlived their usefulness. A recent survey on hypothetical cases in engineering ethics conducted by the journal *Chemical Engineering* was introduced by the statement that “there are written codes of ethics, but they are often of little value.”¹ In light of this preface the survey then revealed: “Although the American Institute of Chemical Engineers, the professional society of many of our U.S. readers, has a code of ethics, this was almost universally ignored in determining the solutions to our survey problems. Fewer than a half-dozen [out of 4,318] respondents even mentioned a code of ethics at all.”²

The lack of reference to the codes, if it can be assumed to be typical of all engineers, seems to me to be an important piece of information if one is proceeding on the assumption that the codes are meant to be a set of ethical rules that are to govern engineers in their professional lives. In the following, it is my aim to show that the avoidance of the codes by the respondents to the survey is justified because the codes of engineering ethics, in their present form, should not be utilized as a set of ethical rules of behavior and, further, that the attempt to provide such a set of rules is not justifiable. In a more positive vein, I then propose that the codes of ethics be replaced by a set of “guides for ethical engineering decision making.”

BACKGROUND

Occupational groups aspiring to professional status have historically made one of their foremost concerns the development of a code of ethics. The American Medical Association (AMA), founded in 1847, adopted its first, very extensive code in the same year.

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The adoption of a code is significant for the professionalization of an occupational group, because it becomes one of the external hallmarks testifying to the claim that the group recognizes an obligation to society that transcends mere economic self-interest, an obligation incurred in exchange for the power to regulate itself and to define requirements for membership in the profession. Given either of the two dominant sociological perspectives on the nature of professions, the exchange-structural view or the power-theorist view, a code of ethics thus is a central aspect of the process of becoming recognized as a profession. On the exchange-structural view, a profession is based on a contractual relationship between society and the profession, where the code indicates how the profession will police itself in exchange for the autonomous control of its membership, which is necessary given the specialized knowledge of the profession. On the power-theorist view, the codes are a means to present the proper image to the public so that the profession will be able to attain prestige and monetary rewards.³ While an understanding of the justification and motivations for the development of a code of ethics, as well as its contents, may thus be influenced by sociological considerations, the existence of a written code seems to be a necessary ingredient of becoming recognized as a profession. As put by one sociologist: "For the newer professions, formation of professional codes may be viewed as part of a defense strategy. The occupation 'proves' that it is a profession by presenting its credentials (i.e., the code of ethics)."⁴

The engineering profession, as well as many other groups aspiring to professional status during the second half of the nineteenth century, recognized the need for a code of ethics. However, for engineering the process was a relatively slow one, and it was not until June 23, 1911, that the American Institute of Consulting Engineers became the first engineering society in the United States to adopt a code of ethics.⁵ The American Bar Association (ABA) had adopted its first national code in 1908 and the National Funeral Directors Association, based directly on its professional aspirations, had accepted one as early as 1884.⁶ After 1911, however, a number of other major engineering organizations adopted codes of their own in quick succession, including the American Institute of Electrical Engineers (AIEE) in 1912, and the American Society of Mechanical Engineers (ASME) and the American Society of Civil Engineers (ASCE) in 1914.⁷

Once the American engineering profession began formulating codes of ethics, not only did a multiplicity of codes emerge, but a process of seemingly endless revision of existing codes also got under way. While the AMA took about one hundred years to undertake a major revision of its code, in engineering the codes became a source of constant activity, owing in large part to two major issues: the quest for unity in the engineering profession; and the issue of responsibility for the public welfare. As early as 1920, efforts were being made by the Federated American Engineering Societies to produce a common code because "what was forbidden in one code might be tolerated by another."⁸ At about the same time the reformer Morris Cooke was arguing that the neglect of the public welfare was a basic flaw in prior codes and that what was needed was "the flatfooted declaration that good engineering must be in the public interest."⁹ It is instructive to note that in 1979 the issue of a unified engineering code was still a pressing one,¹⁰ which to this juncture has not yet been resolved, and that the concern

of the engineer for the public welfare has still not been completely resolved in the codes when considered in relation to the employed engineer.¹¹

Underlying the numerous attempts to develop an adequate code of ethics for the engineering profession, however, has been an idea that has become almost an article of faith, namely, that engineering, in order to be considered a profession, must have a code of ethics very much in line with the format of the early codes. It would thus appear that, in the quest for unification and refinement of the codes, a more fundamental concern is being widely overlooked, that being the issue of whether or not a code of ethics is appropriate for the engineering profession at all. The major purpose of this paper is to suggest that the historical evolution of the engineering codes of ethics has made them inappropriate for fulfilling one of their major, if not the major, functions, that of fostering moral behavior on the part of engineering practitioners.¹² At the same time I want to argue on the positive side that the problems inherent in the codes do not militate against the responsibility of engineering educators to provide training in ethics, and specifically engineering ethics, so that future engineers will become mature and autonomous decision makers in their professional lives. A role for an engineering code of ethics significantly different from the roles currently played by the codes is thus proposed, namely, the replacement of the codes with a set of "guides for ethical engineering decision making."

The conclusions presented in this paper rest on the claim that the codes, as they are currently formulated, potentially create moral conflicts for engineers, such that engineers will be unable to justify univocally their actions if they consider themselves individual autonomous agents as well as professionals governed by a code of ethics. These conflicts can be avoided if the codes are restructured at their very foundation in light of a recognition of what should be their major function—to serve as guides to individual engineers who wish to act ethically in instances where their previous experience proves insufficient to arrive at a rational, autonomous decision. A thrust away from codes of ethics seen as rules of conduct is thus proposed. As Daniel Mead, a former president of ASCE, put it in the 1941 *Manual of Engineering Practice*:

It is unlikely that a man of advanced age and long experience would, in his ordinary relations in life, find it necessary to study a code of conduct in order to determine what his own conduct should be; neither would he ponder very deeply concerning the various possible outcomes of his action. His answer would be given at once, based on his established principles, and would probably be correct. If, however, the conduct concerned new conditions entirely beyond and different from his previous experience, then comes the necessity for due consideration; and in such cases the opinion of those who have had similar experiences and have reached definite conclusions cannot safely be ignored.¹³

HISTORICAL CONTEXT

In order to clarify the problems inherent in the engineering codes of ethics, the motivations at work in giving the codes their current form need to be recognized. When engineering was in its infancy as a profession, the models available for emulation were those provided by the traditional professions of law, theology, and medicine.

Each of these professions had a long history of practice to draw on, a firmly established status in society, and a definite focus for its activities, namely, the welfare of individual clients. The 1847 AMA code, for example, treated the public welfare only in passing, and then primarily in the context of "enlightening" the public, while by far the major portions of the code were concerned with the physician/client relationship and the dealings among physicians.¹⁴ Engineers believed that the status granted to the other professions could be theirs through the formation of professional organizations and through the devising of a code of ethics modeled on those of the other professions. As an early commentator put it: "Their [the older, more conservative societies'] concern is mainly for creating and preserving a certain prestige. . . . The reasons for the creation of the 'standards' are those which underlie the ideals of the closed shop which, originated by the medical profession, have been adopted in large part by the lawyers and put into still wider effect by the labor unions."¹⁵ Although the motives of engineers in this regard need not be questioned, it is clear that the engineering leadership was very concerned with strengthening the standing accorded to engineering activities and to engineers by the public. For Schuyler Wheeler, the original driving force behind the first AIEE code, the major interest was in furthering the "importance, dignity, and strength" of the engineering profession.¹⁶ As Edwin Layton has argued in his important history of engineering: "Spokesmen for the engineering profession have, in fact, frequently made status the fundamental aim, and other professional values means to this end. Thus, engineers have argued that in order to gain more status their profession should show a greater sense of social responsibility."¹⁷

The emphasis on status can be seen, in retrospect, to have been unfortunate in several respects. It meant, first of all, that in utilizing the model of the older, more prestigious professions, the engineering organizations overlooked their unique role in society, a role that could not be expressed simply in terms of the traditional professional/client relationship. The early codes failed to take into account the widespread consequences of engineering work. They instead obligated engineers primarily to their immediate employers. Both the AIEE code and the ASME code, which were almost identical, stressed the engineer's duty to the client. The AIEE code reads: "The engineer should consider the protection of a client's or employer's interests his first professional obligation, and therefore should avoid every act contrary to this duty." Discussion of the relationship of the profession to the public, on the other hand, is limited to extending the knowledge of engineering matters, injunctions against discussions in the public press, and limitation of the types of statements engineers should make in public. In practice this narrow focus on the employer or client meant that the activities of the engineering professional became inextricably tied to the goals and values of the business community, since the vast majority of engineers were (and still are) employees of corporations. As a result the ideals central to the notion of professionalism, such as independence of judgment, became endangered.

Whereas a narrow focus on the welfare of an individual or a group of individuals may be appropriate for the majority of physicians and lawyers, the technological enterprise by its very nature tends to have consequences for a much wider public. When an engineering decision is made it may affect the lives of thousands, or even millions, of people, such as in the instance of the widely publicized DC-10 door lock

case or in the Kansas City Hyatt-Regency disaster. Yet in the early codes engineers are asked to look at possibly disastrous consequences of their decisions only in terms of the interests of the client or employer. What is the engineer to do if the employer, such as in the Pinto gas tank case, decides that it is in his or her best interest to endanger the lives of a certain number of people? More recent codes have attempted to shift the focus away from a sole concern with a client or employer but, as will be argued later in the paper, these attempts have done little to improve the situation of the engineer. The early codes set a tone of limited responsibility by engineers that has yet to be overcome. The AIEE position on whistle-blowing can be summed up by the following quotation from the code: "If any other considerations, such as professional obligations or restrictions, interfere with his meeting the legitimate demands of a client or employer, the engineer should inform him of the situation." What else engineers should do is left unsaid, since professional obligations are then defined in terms of the relationships between engineers, rather than between engineers and the public. In fact, the relationship between engineers is the primary focus of most of the early codes.

The second weakness inherited from other professional codes was that the engineering codes were formulated in such a way that the status of the profession became an even more pronounced goal for the engineers than it had been for physicians in the AMA code. The 1914 ASCE code, for example, consists of six short sections, one of which is concerned with the relationship of engineers to clients. The other five deal with injury of another engineer, supplanting another engineer on a job, competing with other engineers, and advertising. These sections are clearly directed at creating a monopolistic business environment. The recent decision by the FCC undercutting restrictions on professional advertising supports this contention. Yet as late as 1969, Milton Lunch, the general counsel of the National Society of Professional Engineers (NSPE), reported the position of the NSPE Board of Ethical Review "that advertising of professional services was not a desirable practice because it tended to commercialize the profession."¹⁸ Much of the content of the early codes was thus directed at improving the financial posture and the standing of engineers in the wider community, rather than at specific ethical issues. Although the trend since the formulation of the first codes has been to give more emphasis to the public welfare, even recent codes still emphasize the fraternalism that Cooke recognized in 1922: "These obsolete codes . . . were drafted under the conception that engineering was a craft and those who practiced it constituted a fraternity and as such owed a higher obligation to fellow-practitioners than to the public."¹⁹

With additions and revisions to the engineering codes over the last seventy years, the emphases in the codes have changed significantly, especially with regard to public health and safety. However, while the thrust has been away from a sole concern with the client or employer and the professional, the injunctions placed upon engineers by the early codes have largely remained. The unfortunate consequence of the codes' historical evolution has thus been that in the present codes a mixture of duties, without any clear focus, has been established for the practicing engineer. This has become an especially pressing problem with the trend toward societal accountability of professional activity. Questions are now being raised by the public as to why engineers (and others) are not more cognizant of the consequences of their actions, why they are not

aware of their societal responsibilities, and why the profession is unable to enforce its codes of ethics.²⁰ As Jacques Barzun has warned, the professions are "vulnerable institutions." If the public perceives that the professions are more interested in their own welfare than in that of the public, they run the risk of being demoted "to the level of ordinary trades and businesses."²¹

The questioning of the presumed infallibility of the professions has resulted in a considerable amount of soul-searching in the engineering profession. During the last ten years attention to professional ethics has been greatly increased in the engineering organizations. Yet progress, especially in relation to the codes, has been slow. In part this has been the result of the focus given to the initial codes, which concentrated more on fraternal issues than on questions of ethics as that term has usually been understood. More recent codes have emphasized such questions as the safety of the public, the quality of life, and public disclosure and have thereby given the codes a less restrictive scope of concern.²² However, they have retained their focus on the client or employer and on matters of professional courtesy and etiquette. For instance, they still emphasize issues of competition, advertising, and the reputation of individual engineers and of the profession. The mixture of ethics and fraternal concerns in the current codes links them to their predecessors and necessitates a fundamental reexamination of the codes. This reexamination will ultimately raise questions about the very nature of the codes themselves.

STATUS OF THE CURRENT CODES

Contemporary codes of engineering ethics are generally divided into the following parts: a set of principles that preface the code as a whole; and a number of more explicit rules that are intended to contain more specific interpretations of the principles. The relevant question for us is what implications this form of organization has for the adequacy of a code of ethics.

Let us first look at the principles. As was pointed out earlier, the first codes consisted primarily of specific rules detailing the obligations of engineers to their employers or clients and to the profession. Principles set out as prefaces to the codes, when included at all, usually took the form of vague general statements, such as in the 1914 ASME code, which tells engineers that "all their professional relations should be governed by principles of honor, honesty, strict fidelity to trusts imposed upon them, and courteous behavior toward all." It is only the more recent codes that have provided principles in a context more specifically applicable to engineering. In this regard the adoption in 1947 of the first code of the Engineers' Council for Professional Development (ECPD) was significant, since it included in its rules the injunction that the engineer "will have due regard for the safety of life and health of the public and employees." This rule was reflected in the foreword of the code, where it is enunciated as a principle that "the engineer will discharge his duties with fidelity to the public, his employers, and clients, and with fairness and impartiality to all." Furthermore, it is the engineer's "duty to interest himself in public welfare, and to be ready to apply his special knowledge for the benefit of mankind."²³

The 1947 code is of great significance because it demonstrated an awareness by the profession of responsibilities beyond those toward the profession and clients or employers. However, the wording in relation to the public remained relatively innocuous, stressing “due regard for” and “interest in” the public. In successive versions of the ECPD code, including revisions in 1963 and 1974, the concern for the public became more pressing, so that by the latest version in 1977 human welfare had attained first rank among four explicitly enunciated principles.²⁴ The principles pertain to the different relationships the engineer has to society, to clients or employers, and to the profession. They reflect a mixture of ethical and fraternal concerns:

1. using their [engineers'] knowledge and skill for the enhancement of human welfare;
2. being honest and impartial, and serving with fidelity the public, their employers and clients;
3. striving to increase the competence and prestige of the engineering profession; and
4. supporting the professional and technical societies of their disciplines.

While it is interesting to note the evolving concern with human welfare in the codes, the issue of concern to us is whether the resulting complex set of principles is consistent insofar as the various principles lead to identical actions in the same circumstances. If they do not, that is, if different principles justify opposing decisions, then the codes are *prima facie* ambiguous and consequently not a useful guide to action. A brief illustration will show that this is the case.²⁵

James Doe is employed by a firm that is designing a chemical plant intended to produce a deadly nerve gas to be used in time of war. He discovers what he takes to be a flaw in the design that will make it remotely possible that some of the gas will be released into the surrounding environment of the plant. Upon bringing his discovery to the attention of his superiors, he is informed that his firm considers the risk acceptable and that it is in the interests of his employer that the project go ahead as scheduled. He is further told that the information on which his claim is based is proprietary and he is therefore not to discuss the issue in public.

Given this, perhaps extreme, hypothetical example, two issues arise in relation to the fundamental principles. First, James Doe must ask himself whether he is using his knowledge for “the enhancement of human welfare” in working on the project. Although it might be argued that in the “right hands” the nerve gas may be used to bring about a quicker peace in time of war and thus serve human welfare, he cannot know that the “right hands” will ultimately be in control of the gas.²⁶ It must at least be conceded that some engineers would decide that the project did not enhance human welfare. If Doe came to that conclusion, the practical solution would be for him to refuse to work on the project or to resign his position. However, if we for the moment use only the principles in the code, we must also notice that he is asked to serve his employer with fidelity, and it is at least questionable whether he would be doing so if he is needed on the project and instead resigns his position. Thus it is at least possible that principles 1 and 2 of the ECPD code would make opposing demands of him.

Further, the second principle by itself can result in inconsistent demands on the engineer. In it the engineer is asked to serve with fidelity both the public and his employer. Given the example, this may not be possible for Doe, for in order to serve the public he would need to inform what is called in the specific rules of the code "other proper authority," whereas the rules related to fidelity to the employer demand that he "will not disclose confidential information concerning the business affairs or technical processes of any . . . employer . . . without his consent." Since he has been told explicitly that the relevant information is confidential, it is not obvious how he could make the proper authorities aware of it without violating the rule of confidentiality.

The basic problem thus is that there appears to be no way of adjudicating between the demand of the separate principles and between the separate demands of each principle. In reply to this point it might be argued that the ECPD code does make an overriding claim which prefaces the individual principles, namely, that "Engineers uphold and advance the integrity, honor and dignity of the engineering profession by. . . ." Perhaps then a duty to the profession is a more fundamental principle designed to resolve conflicts among the other principles, although a more likely explanation is that it is simply intended to be an explanatory device. Assuming for the moment that it is an ethical principle, we can still ask how such a principle could support subprinciples that imply potentially opposing courses of action. Furthermore, in the fundamental canons for engineering practice in the same code, the engineer is told to "hold paramount the safety, health and welfare of the public." Given the standard meaning of "paramount," it would seem that this claim takes precedence over any other, yet it is not given a premier place in the statement of principles. Rather it is placed on the level of concrete injunctions, a level supposedly derivative from the principles. If it were given a premier place, it would at least help James Doe in this particular situation.²⁷

At this point rational engineers should be confused. Which injunction should they follow in which cases? The code itself does not provide a way of resolving the conflicts on the level of principles. A second course of action might then be to ignore the general "philosophical" principles and to act on the basis of the specific rules found in the ECPD code. The first difficulty encountered there, however, is that the individual rules are claimed to be explications of the principles and thus moving to this level only solidifies the contradictory nature of the claims, as was shown in the conflict between confidentiality and reporting one's knowledge to the proper authority. More significantly, a number of engineering organizations have adopted only the general principles of the code and not the specific rules associated with them.²⁸ Thus there is some evidence that these organizations either would reject some of the specific rules or would be opposed to the specific nature of the interpretations in the rules.²⁹ The more specific the rules become, the more likely they are to be interpreted as having an absolute and exceptionless character.

Although a great deal of detailed work would be necessary (and should be undertaken) to determine all the specific problems associated with the ECPD and other codes, the preceding is enough, given the aim of this paper, to show that the way the codes are currently formulated is inadequate and that the codes therefore need to be conflicting courses of action seem equally plausible in light of

at this point that a number of philosophical ethical theories—Kant's, for instance—have the very same problem in that they generate rules that are potentially in conflict when applied to specific situations. Let us therefore ask ourselves if the current codes can be modified in such a way as to account for the problems raised.

MODIFYING THE CODES

In attempting to revise the codes we might begin with the concrete injunctions laid down for the engineer, because those are seemingly what is required to judge the appropriateness of actions in engineering practice. This approach would in effect be a reversion to the early codes, where the concrete rules of practice were prefaced only by a brief statement of exhortation. If such a set of rules is to serve as a consistent determinant of actions, however, it must include a more fundamental principle that will resolve possible conflicts between the specific rules laid out in the code. If the notion of a foundational principle is objected to, the code would at least need to describe a method for resolving possible conflicts or, alternatively, at least be based on such a method. Thus, in either case, there must be, at least implicitly, a higher court of appeal than the contents of the rules themselves.

An interesting development in this regard can be found in a model code developed by Stephen Unger.³⁰ Unger adopts the notion from the ECPD code that engineers "shall regard their responsibility to society as paramount," but to sections that are in potential conflict with this claim he adds a subordinating clause. For instance, in the section on employers or clients he writes that engineers shall "act as faithful agents or trustees in business or professional matters, *provided such actions conform with other parts of this code* [emphasis added]." This model code, if "paramount" is interpreted in the strong sense of "overriding," thus at least establishes a hierarchy of rules such that the responsibility of engineers to society could be interpreted as a way of resolving conflicts between rules. Unger's code also addresses a number of other problems I have raised in this paper. It should therefore, in my opinion, be regarded as a significant advance over previous codes. It does not, however, address the basic problem found in the other codes, namely, the coercive nature of the codes. It is this problem that I believe makes it necessary to replace the current codes with a different set of documents.

Whether the final basis of appeal is to a basic principle(s) or to concrete rules, the implications for the engineer are the same. He or she must accept this foundation in order to be considered an ethical engineer by the profession. Yet the previous discussion argues against the fact that all engineers will identify with any given rule or principle provided by the profession. My discussion of the history of the codes has shown that even the basic claim regarding the paramountcy of society's welfare has been a disputed issue. More important, it is doubtful that engineers can legitimately be coerced into acting on the basis of externally imposed moral claims. As John Ladd has argued: "Even if substantial agreement could be reached on ethical principles and they could be set out in a code, the attempt to impose such principles on others in the guise of ethics contradicts the notion of ethics itself, which presumes that persons are autonomous moral agents."³¹ But if these principles are to serve as the ethical foundation of the profession, then engineers must be coerced into upholding them.

Now, if we are dealing with somewhat sophisticated engineers, they will have developed, at least implicitly, their own ethical foundations on which they base their actions in everyday life. They will thus see a particular course of action as justified, based on this foundation, in a particular situation. Clearly the foundation advocated by the profession will not necessarily coincide with the one a particular engineer has developed in his or her everyday life, and thus competing courses of action may be advocated. For example, an engineer may believe, based on his or her foundation, that he or she should not harm any human being and may have sufficient justification for that belief. This claim, upon reflection, may well be in conflict with the position of the ECPD code to hold the welfare of the public paramount, for achievement of this end may in a particular situation require harming some individual members of the public.³² Reasonable engineers can thus find themselves in a quandary. They can act in accordance with their own ethical foundation and thus wrongly by that of their engineering organization, or they can act rightly in terms of the ethical foundation of the organization and thus wrongly in terms of their own. While it is possible that in many instances similar courses of action would be advocated regardless of which foundation is considered, in cases where a conflict arises individual engineers would seem inevitably to come out the losers. Can we in any justified sense, then, ask the engineers to act counter to their own deeply held moral beliefs?

I would claim that we cannot. Given the assumption that one's own ethical foundation is freely and rationally arrived at, it is not clear what source of justification an engineering organization would have for imposing its ethical foundation on the individual. It must be emphasized in this regard that I am here referring specifically to questions of ethics, not to standards of professional behavior in general. It seems to me that such standards can have a nonmoral function and thus can be based on a foundation different from an ethical one. For instance, some standards of professionalism, such as educational requirements, could be founded in a contractual agreement between the profession and the public. Thus it can be argued that certain standards of nonmoral behavior can be demanded as condition of membership in an organization, such as Boy Scouts being required to be neat and cheerful, but the demand for moral behavior on the individual's part should be able to override these standards.³³

If engineers are to be autonomous moral agents, then the codes of ethics, as they are currently formulated, provide an unacceptable pathway to moral behavior. However, there are in fact good reasons for the existence of such codes. Their primary purpose, although not their sole one, is to help engineers arrive at morally correct decisions. This is what is of ultimate benefit to society and to the profession. The means to accomplishing this goal lie not in setting down a series of hard and fast rules for the engineer, but rather in the process of "educating toward autonomy."

REPLACING THE FUNCTION OF THE CODES

Based on the preceding argument, it seems to me that the role of an engineering "code of ethics" must be rethought. I have indicated some problems with the codes, but I think it would be a mistake to draw from these criticisms the conclusion that the

profession should not have a role in the moral development and practice of its membership. We must rather ask ourselves once again what demands can be made of practicing engineers in regards to morality. Is it of primary importance that they obey a given set of rules or adhere to an externally imposed ethical principle, or is it not rather that they behave morally in their professional activities? From society's point of view, at least, it is surely the latter that is more central. In the remainder of this paper I will argue that the interests of society, and therefore indirectly the interests of the profession, can best be met not by forcing engineers into predetermined courses of action in regard to moral issues, but rather by educating them to become autonomous decision-makers in a context specific to engineering.

The reason for the existence of engineering ethics in the first instance is that moral problems are encountered in engineering that do not arise in our everyday lives. Society does not lay out explicit moral rules for us to follow in our everyday lives, but rather expects us to make some decisions based on our own volition. "You should never lie, no matter what the circumstances," might be an acceptable moral rule for some of us, but we would feel unjustifiably restrained if society passed a law imposing such a rule on all of us. We generally recognize that on the moral plane, as opposed to the legal one, we must justify our own decisions.

The justification for engineering ethics is, then, not that it tells engineers what they *must* do in specific circumstances, but rather that it aids in the decision-making process in situations that would not usually arise in their everyday lives. Engineers will encounter *novel* situations in their practice and they deserve guidance in relation to them. Yet they should be able to act on their own, rationally arrived at basis of morality. I thus propose substituting for the current codes of ethics a set of guides for ethical engineering decision making. These "guides" should indicate what novel situations engineers in a particular field of practice might encounter and thereby forewarn and alert them to these situations; they should also point to the kinds of factors typically considered relevant to such situations. Engineers could then use the "guides" in conjunction with their own justified moral foundation in order to evaluate a particular situation from the moral point of view.

For example, if engineer Jane Smith for the first time finds herself in a situation that might involve a conflict of interests, turning to the ECPD code would tell her that "Engineers shall not knowingly undertake any assignment which would knowingly create a potential conflict of interest between themselves and their clients or their employers" and give her some other rules regarding financial matters that do not explicitly mention a conflict of interest. The code, however, neither explicitly specifies what a conflict of interest might be,³⁴ nor does it require the engineer to take steps to determine whether or not a potential conflict of interest exists.

The proposed "guides" would first define *conflict of interest* in a general way and then would enumerate possible *examples* of conflicts of interest. A limitation of the ECPD code in this regard is that it restricts conflicts of interest to the professional life of the engineer, primarily to different clients, whereas conflicts of interest can also occur between the professional and the personal lives of the engineer.³⁵ The "guides" would further contain a discussion of: the legal status of conflicts of interest; the likely consequences they could have; the implications of proposed courses of action for the individual, the profession, and society; the distinction between actual and potential

conflicts; the distinction between a real conflict and the appearance of one; and the different degrees of seriousness of conflicts of interest.

Weighing this information in conjunction with her own moral rules and/or principles, Jane Smith could then arrive at a decision in regard to a particular situation. Let us say that a supplier to her employer has offered her a Christmas gift that has a value of \$50.00. Should she reject or accept the gift? Should she report it to her employer? Should she turn it over to her employer? Should she take any other actions? The answer in this instance depends on a variety of factors. Is she in a position to affect business dealings with her supplier? What are her beliefs in regard to the intentions of the gift? What is considered a gift of nominal value in her industry? How will the gift look to the public? What will her employer's reaction be toward her? These and many other factors will be of importance to her considerations, and the "guides" should make her aware of what type of data would be relevant to the situation.

Let us add, by way of example, that Jane Smith's basic moral principle is that she should try to achieve the maximum beneficial consequences for everyone affected by an action. She would then utilize this principle in conjunction with the specific information in the case to arrive at a decision. If, alternatively, her moral framework consists of a set of general rules, one of which is that she should not knowingly harm anyone, then she would use that rule. In one case she might accept the gift, in the other she might not. In either case, however, she should be able to justify (not just rationalize) her decision in a reasoned manner.

At this point it might be objected that the entire procedure is irrelevant, because Smith's company probably has a specific internal policy regarding gifts. Such a policy would certainly be relevant to her analysis and would in all probability be the major factor. Depending on her moral framework, it might even make an evaluation of the situation unnecessary. However, not all engineers work for corporations with such a policy, and those who do may have to interpret vaguely worded policies, which perhaps employ terminology like *unreasonable* or *nominal*. Nor are all engineers employed engineers. Finally, the example given is only one instance of many possible conflicts of interest.

An attempt to explicate the above example also raises some rather obvious questions that require consideration. First, it might be claimed that the analysis function is already being performed by such groups as the NSPE Board of Ethical Review, by the publication of hypothetical cases in various engineering journals, and by the publication of code decisions by individual engineering organizations such as the ASCE. The purpose of these is to interpret the codes in a more specific way or to decide when a code of ethics has been violated. The procedures used are, however, generally random, after the fact (or, in the case of advisory decisions, take a great deal of time), often relatively inaccessible, and based solely on the existing codes. Thus, a case will generally be dealt with only after it has come to the attention of an appropriate body and the consideration will be limited to that particular instance. Engineers caught up in their day-to-day work are unlikely to spend the time necessary to dig up the one appropriate case out of the library or out of the volumes of the NSPE decisions. The "guides" would need to be made readily available to all engineering students, and this should be feasible if they were made part of an extensive educational program.

Since the "guides" would be intended for application to specific practical problems, a great deal of effort would need to go into their initial formulation as well as into the periodic updating that would be required in a world of innovative technological and social developments. This would require extensive cooperation not only among engineers and among engineering organizations, but also between engineers and philosophers. Second, it might thus be objected that the past lack of success in adopting a unified code of engineering ethics would be multiplied in relation to the "guides." However, since the "guides" would not have regulative force, would not be normative rules, cooperation in their development might be easier to achieve than it has been in the past. But this is an empirical question, and only the carrying out of the attempt would provide an answer.

Third, it is evident that the proposed "guides" would be much more extensive than any existing code of engineering ethics, and it might therefore be claimed that given the scant attention apparently now being paid to the codes, the "guides" will be even less utilized. In order to deal with this objection, it must be remembered that the "guides" are intended, at least in part, to have an educational function, to help the engineer become an autonomous moral decision maker. My suggestion does, in fact, therefore shift a great deal of the burden not only to the individual engineer, but also to the community of engineering educators, both in the academic setting and in the world of practice. A new task for philosophers and engineers must become educating future engineers for moral autonomy. Engineers must not only be educated to make technical decisions on their own, they must also learn how to make decisions regarding morality. The first step in this regard, given my previous analysis, is the formulation of an adequate foundation on which the individual engineer can base his or her actions. Engineering students need to be taught to look beneath their intuitive reactions to situations in order to discover a common basis for their actions. Then they must be asked to examine this foundation critically to see if it can indeed serve as a consistent supporting basis for their actions. This part of the educational process can be undertaken by philosophers, but a second step is required. Not only must the students be shown that they should act on the basis of a well thought out foundation, they must also gain familiarity with the application of their own foundation to practical moral problems. This application will occur, for them as professionals, in specifically engineering contexts. Only practicing engineers can be familiar with the specific details that arise in such contexts, and they must therefore share the burden of preparing future engineers beyond the technical dimension of their work. The "guides for ethical engineering decision making" should be an aid in this respect.³⁶

OMITTED FUNCTIONS

In replacing the codes in the way I have suggested, a number of functions that have traditionally been a significant focus of the codes will not be dealt with in the "guides." In the concluding section of this paper I will briefly consider possible dispositions for four major functions: fraternal obligations, ideals of the profession, regulative rules, and fundamental moral beliefs.

Fraternal obligations, or requirements of etiquette toward other members of the profession, constituted a major portion of the early codes, and they still have a significant place in the more recent codes. The 1977 ECPD code, for example, tells engineers that they "shall encourage their engineering employees to further their education," that they "shall uphold the principle of appropriate compensation for those engaged in engineering work," and that they "shall not solicit employment from clients who already have engineers under contract for the same work." Fraternal obligations such as these can be justified under a variety of conceptions of professionalism, perhaps in the strongest sense through a model which requires autonomy for the profession so that it can regulate its own activities.³⁷ However, it is less clear that they can be justified on an ethical basis, and even if they could be, my previous analysis has shown that this alone would not be enough to make them binding on the engineer. I do, however, believe that an individual engineering organization is entitled to require adherence to some rules as a condition of membership. No engineers are required to join an engineering organization, and those who do so will most likely be motivated by some presumed benefit to themselves.³⁸ In general, then, fraternal obligations should have the same standing as they would in any other voluntary organization,³⁹ but they should in no case be able to override the basic moral convictions of an individual member. If the engineering organizations wish to retain such fraternal rules, they should thus remove the misleading heading of "ethics" from them and replace it with a title like "Social Rules for Membership in . . .".³⁹

A major point of discussion in relation to codes of ethics has been the intermixture in them of normative rules of behavior and ideals of the profession. Within the codes themselves the distinction has not always been made clear, and consequently issues of enforcement have been a constant problem, since the striving to meet ideals is not regulatable in the same way as is a minimum adherence to a rule of behavior.⁴⁰ Thus, for instance, it would be difficult to determine when a particular engineer has failed to "be committed to improving the environment to enhance the quality of life," whereas it is fairly easy to judge when the following rule has been violated: "Listings in the classified section of telephone directories [shall be] limited to name, address, telephone number and specialities in which the firm is qualified without resorting to special or bold type." If the emphasis in a code is on enforcement, then characterizations such as the latter become preferable. Along with this tactic, however, also comes the danger of trivializing the contents of a code. Yet a set of written ideals for a profession can have a valuable role in the encouragement of the membership of a profession to strive for an ideal of service to society. Thus the publication of a document containing "The Ideals of the Engineer" would be a legitimate contribution by the profession. Again, however, it would need to be made clear to engineers that these do not, and should not, constitute a set of enforceable rules of behavior.

Perhaps the strongest counterargument to my position on the codes of ethics is that their elimination will do away with the possibility of the profession's meeting its obligation to society in relation to basic standards of safety and human well-being. Given either of the two dominant sociological models of the professions mentioned previously, however, this argument strikes me as being specious. In light of the exchange-structural view, it would seem that the professions require a code of ethics in

order to demonstrate to society that they are fulfilling their part of the bargain that has given them freedom from societal control. In light of the power theory, codes are primarily a means to further the profession itself and to get society to go along with this self-aggrandizement. As Lisa Newton has pointed out, however, the record of the professions in relation to enforcement of the codes points more to furthering the prestige and power of the professions than it does to meeting obligations to society.⁴¹ In engineering, in particular, the record has been weak in this regard. Stephen Unger, who has for a number of years been involved in the ethics activities of engineering organizations, writes:

They [the organizations] have largely confined themselves to disciplining members in the consulting field for violations of code provisions pertaining to business practices. In many, if not most, cases that have led to the imposition of sanctions, violations of law as well as ethics codes were involved. An occasional plagiarism case stands out as an exception. I know of no case of an engineer being censured for an act contravening the public safety, health, or welfare, such as involvement in the release of harmful chemicals to the environment.⁴²

When it comes to enforcement of issues of public safety and human well-being, it is thus not clear that engineering has earned the privilege of self-enforcement. This may not even be possible, given the legal system in this country, according to which the engineering organizations run the risk of lawsuits by censured engineers, unless normative rules are given statutory authority through a licensing process similar to that of the AMA or the ABA.⁴³

Ensurance of adequate standards of safety and health are demands society can make of a profession. Unenforceable or unenforced codes of ethics, however, are not the appropriate instruments of regulating such matters. Perhaps more effort should be expended instead on codifying such requirements in the legal system, as has already been done in numerous instances in such areas as product liability, the ASME boiler code, or professional liability for services rendered. Many engineers will oppose such a suggestion on the grounds that only the profession can set up and regulate such standards. The legal system, however, has not shown itself to be opposed to coordination with the expertise of professionals.

Finally, the "guides to ethical engineering decision making" will not address basic moral issues such as fairness, honesty, and impartiality, which are a significant dimension of the present codes. Furthermore, these issues are not dealt with directly in any of the preceding suggestions for supplementing the "guides." Nor, it is my position, should they be. If truth-telling is a moral obligation, it is a universal one, not just one that applies to engineers. To propose that special mention must be made of it in an engineering code assumes either that engineers have no prior moral education or that the remainder of society fails to adhere to any basic moral beliefs. Even if either of these assumptions were justified, it cannot be the role of the profession to teach engineers to be moral. The profession is justified only in aiding engineers to apply their moral foundation to a specifically engineering context.

A number of functions have been performed by the codes of ethics. The above brief consideration has shown that my suggestion for elimination of the codes does not

mean that all of the functions should be eliminated. Some of them are quite valuable in their own right. The discussion, however, points out that the mixture of concerns in the existing codes in part is responsible for much of the confusion surrounding these codes, whereas that discussion should have, as I have argued, been concentrated on more fundamental issues.

SUMMARY

I have attempted to show that morality should not be legislated in the profession of engineering any more than it can be in our everyday lives. Yet this is what the engineering codes of ethics, as they are presently formulated, attempt to do. Given this and other problems with the codes, I have therefore advocated that for the codes of ethics a set of "guides for ethical engineering decision making" should be substituted. Rather than laying out actual rules of normative behavior, these would designate areas of concern for practicing engineers. This suggestion in turn implies that increased emphasis must be given in engineering education to the ability of engineers to apply a rationally chosen ethical foundation to specific engineering situations. An added task is thus proposed for all engineering educators, because moral autonomy is true autonomy only if it is based on sufficient information and reasoned choice.

NOTES

An earlier version of this paper was presented at the Second National Conference on Ethics in Engineering held in Chicago in March 1982. I am grateful to Dr. Vivian Weil for organizing the conference and to Professor John Ladd for his extensive comments on several versions of this paper.

1. Philip M. Kohn and Roy V. Hughson, "Perplexing Problems in Engineering Ethics," *Chemical Engineering*, May 5, 1980, p. 100.

2. Roy V. Hughson and Philip M. Kohn, "Ethics," *Chemical Engineering*, September 22, 1980, p. 132. An earlier survey, with similar results, was carried out by the editors of the journal in 1963.

3. Lisa H. Newton discusses extensively the relationship of codes of ethics to these sociological perspectives in "The Origin of Professionalism: Sociological Conclusions and Ethical Implications," *Business & Professional Ethics Journal* 1, 4 (Summer 1982):33-42.

4. Arlene K. Daniels, "How Free Should the Professions Be?" in *The Professions and Their Prospects*, ed. Eliot Freidson (Beverly Hills: Sage Publications, 1973), p. 46.

5. William H. Wisely, "The Influence of Engineering Societies on Professionalism and Ethics," *Proceedings, Conference on Ethics, Professionalism and Maintaining Competence* (American Society of Civil Engineers, March 1977), pp. 56-57.

6. Burton J. Bledstein, *The Culture of Professionalism* (New York: W. W. Norton, 1976), pp. 34 and 108.

7. The codes are reprinted in the *Annals of the American Academy of Political and Social Science* 101 (May 1922):271-77.

8. A. G. Christic, "A Proposed Code of Ethics for All Engineers," *Annals of the American Academy of Political and Social Science* 101 (May 1922):99.

9. Morris L. Cooke, "Ethics and the Engineering Profession," *Annals of the American Academy of Political and Social Science* 101 (May 1922):70.
10. Andrew G. Oldenquist and Edward E. Slowter, "Proposed: A Single Code of Ethics for All Engineers," *Professional Engineer*, May 1979, pp. 8–11.
11. C. C. Herskind, "The Code of Ethics and the Professional Engineer in Industry," *Professional Engineer*, May 1970, pp. 27–29.
12. Much of the analysis undertaken here could be applied to the codes of ethics of other professions as well. However, the multiplicity of engineering codes, their lack of legal status, and the apparent inability of engineers to develop sufficient enforcement powers makes the situation for engineering somewhat unique.
13. Daniel W. Mead, "Why a Code of Conduct?" *Standards of Professional Relations and Conduct*, Manual of Engineering Practice, no. 21 (American Society of Civil Engineers, 1941), p. 12.
14. The 1847 AMA code is reprinted in the appendix to the *Encyclopedia of Bioethics*, Warren T. Reich, ed.-in-chief (New York: Free Press, 1978).
15. Frederick H. Newell, "Ethics and the Engineering Profession," *Annals of the American Academy of Political and Social Science* 101 (May 1922):81.
16. As cited in Edwin T. Layton, Jr., *The Revolt of the Engineers* (Cleveland: Press of Case Western Reserve University, 1971), p. 84.
17. *Ibid.*, p. 6.
18. Milton F. Lunch, "Engineering Ethics: A Blend of the Ideal and the Practical," *Professional Engineer*, April 1969, p. 33.
19. Cooke, *op. cit.*
20. See, for example, the discussion by Charles R. Schrader in "Professionalism—And a Relevant Code of Ethics," *Engineering Issues*, October 1974, pp. 337–41.
21. Jacques Barzun, "The Professions under Siege," *Harper's*, October 1978, pp. 61–68.
22. See the discussion on the evolution of a concern for the public welfare in the codes in Stephen H. Unger, *Controlling Technology: Ethics and the Responsible Engineer* (New York: Holt, Rinehart and Winston, 1982), pp. 49–50.
23. The 1947 ECPD and other engineering codes are reprinted in the *Annals of the American Academy of Political and Social Science* 297 (January 1955):53–58.
24. In the following I will be using the 1977 version of the ECPD code as the source for my discussion. In terms of memberships in engineering organizations, more engineers are bound to this code than to any other. Major competing codes are those adopted by the Institute of Electrical and Electronics Engineers and the NSPE, but as Oldenquist and Slowter, *op. cit.*, have pointed out, the codes share much in terms of content. Since 1977 the ECPD has changed its name to Accreditation Board for Engineering and Technology (ABET), which has resulted in some confusion when referring to the code, but it has affected neither the adoption by engineering organizations of the ECPD code nor the contents of the code.
25. For a more complete discussion of this point see my "Society as Engineers' Client," *Liberal Studies Educator* 4 (1981–82):1–10.
26. See the detailed discussion by Robert Baum, "The Limits of Professional Responsibility," in *Engineering Professionalism and Ethics*, ed. James Schaub and Karl Pavlovic (New York: John Wiley, 1983), pp. 287–94, regarding this issue. Baum argues that the knowledge of engineers is limited and that their obligations to obey the teleological principles in the codes are therefore limited. However, he substitutes a doctrine of informed consent for these principles, and therefore his conclusions regarding the basic obligations of engineers differ from my own.
27. Kenneth Kipnis argues that this is actually the case in "Engineers Who Kill: Professional Ethics and the Paramountcy of Public Safety," *Business & Professional Ethics Journal* 1, 1 (Fall 1981):77–91.

28. The extent to which different organizations have adopted parts of the ECPD code is discussed in A. S. West, "AICHE's Position on Codes of Ethics," *Chemical Engineering Progress* 77, 2 (February 1981):22-25.

29. An additional political problem in this regard is pointed out by Oldenquist and Slowter, *op. cit.*, p. 10: "perhaps the most obvious stumbling block has been the 'NIH' (Not Invented Here) concept. One organization is usually reluctant to endorse or accept a concept produced by another organization; this has led to a number of codes only slightly different in wording."

30. Unger, *op. cit.*, pp. 35-46. He adds a detailed discussion of specific parts of the model code.

31. John Ladd, "The Quest for a Code of Professional Ethics: An Intellectual and Moral Confusion," in *AAAS Professional Ethics Project*, ed. Rosemary Chalk, Mark S. Frankel, and Sallie B. Chafer (Washington, DC: American Association for the Advancement of Science, 1980), p. 154.

32. The vagueness of the words *harming* and *welfare* might be considered a weakness in the example. Clearly, the terms need to be interpreted in a more specific way. Their use, however, being internal to the codes, simply reflects another basic weakness of the codes.

33. I have argued in greater detail for this point in "Engineering: Profession and Professionals," *Proceedings, Frontiers in Education Conference* (Institute of Electrical and Electronics Engineers, 1981), pp. 190-95.

34. The code does, however, prohibit certain actions in other rules that are specific examples of conflicts of interest, such as the issue of compensation from more than one client for the same service, but these rules are not tied explicitly to the conflict-of-interest clause.

35. See the extended discussion of examples of conflicts of interest in Mike W. Martin and Roland Schinzinger, *Ethics in Engineering* (New York: McGraw-Hill, 1983), pp. 169-73.

36. For further discussion of the role of engineering educators in the teaching of ethics see my "Professionalism through Learned Autonomy: Ethics Codes as a Tool," *ASEE Annual Conference Proceedings* (American Society for Engineering Education, June 1983), pp. 420-24.

37. Luegenbiehl, "Engineering: Profession and Professionals," *op. cit.*

38. The situation is less clear if licensing is required as a condition for employment. I would argue that a code applicable to such situations, e.g., the NSPE code, should have no fraternal content.

39. John Ladd, *op. cit.*, p. 155, has pointed out that the original use of the word *ethical* in codes was intended simply to distinguish them from criminal (legal) codes. This is a broader usage than most would now find acceptable.

40. See Lunch, *op. cit.*, and Kipnis, *op. cit.*

41. Newton, *op. cit.*

42. Unger, *op. cit.*, p. 56. The appendix to Chalk et al., *op. cit.*, part of which is devoted to surveying the ethics activities of various engineering organizations, also shows that enforcement activities are quite rare.

43. The issue of required licensing is a hotly debated one in engineering. Many engineers escape licensing requirements through what is known as the "industrial exemption." While it is difficult to determine the actual percentage of engineers who are licensed because of the flexibility in the usage of the term engineer, T. E. Stivers uses the figure 325,000 out of 1,200,000 engineers. He also claims "that less than 10 percent of all engineers in industry are licensed." See "Professional Licensing: The Ancient Rite of Protecting the Public," *Consulting Engineer*, September 1975, pp. 41-44.